UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/881,769	06/18/2001	Izuru Nakai	P21131	8245

7055 7590 08/10/2004

GREENBLUM & BERNSTEIN, P.L.C.
1950 ROLAND CLARKE PLACE
RESTON, VA 20191

EXAMINER	
STAICOVICI, STEFAN	
ART UNIT	PAPER NUMBER
1732	

DATE MAILED: 08/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/881,769	NAKAI ET AL.	
	Examiner	Art Unit	
	Stefan Staicovici	1732	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 12-14* is/are pending in the application.

4a) Of the above claim(s) *4* is/are withdrawn from consideration.

5)☒ Claim(s) *1-3* is/are allowed.

6)☒ Claim(s) *12-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 21, 2004 has been entered.

Response to Amendment

2. Applicants' amendment filed May 21, 2004 has been entered. Claim 1 has been amended. Claims 5-11 have been canceled. New claims 12-14 have been added. Claims 1-4 and 12-14 are pending in the instant application.

Election/Restrictions

3. The instant application includes claim 4 that remains withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ayrton (US Patent No. 5,741,456) in view of WO 86/02301 and in further view of Temple *et al.* (US Patent No. 6,228,311 B1).

Ayrton ('456) teaches the basic claimed process of drilling a hole in a multi-layered sheet using a laser without delamination of said multi-layered sheet occurring (see col. 2, line 53 through col. 3, line 18). It is submitted that since delamination is avoided, that the resulting inter-layer pull-off force is smaller than an inter-layer adhesion force.

Regarding claim 12, Ayrton ('456) does not teach a first low-powered laser pulse to drill said hole in said multi-layered sheet and a second high-powered pulse to trim said drilled hole. WO 86/02301 teaches the claimed process of laser drilling a multi-layer sheet by providing a train of low-powered laser pulses to drill through said multi-layered sheet, said low powered pulses preventing delamination, and after said multi-layered sheet has been drilled, higher power pulses are employed. It is submitted that since delamination is avoided, that the resulting inter-layer pull-off force is smaller than an inter-layer adhesion force (see Abstract and page 6, line 4 through page 7, line 14). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a first train of low-powered laser pulses to drill a hole in a multilayered-sheet as taught by WO 86/02301 in the process of Ayrton ('456), because WO 86/02301 specifically teaches that low-powered laser pulses avoid delamination of said multi-layered sheet, whereas Ayrton ('456) teaches laser drilling in a multi-layered sheet while avoiding

delamination of said multi-layered sheet, hence both references solving the similar problem of delamination of a multi-layered sheet while drilling holes therein.

Further regarding claim 12, although WO 86/02301 teaches a second train of higher power pulses, the process of Ayrton ('456) in view of WO 86/02301 does not teach trimming said drilled hole in a multi-layered sheet. Temple *et al.* ('311) teach laser drilling a hole in which the laser power is increased at the end of the drilling process in order to trim the final shape of said drilled hole (see col. 7, lines 1-11). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a second train of higher power pulses as taught by WO 86/02301 to trim said drilled hole as taught by Temple *et al.* ('311) in the process of Ayrton ('456) because, Temple *et al.* ('311) specifically teach that increasing the power of said laser results in an improved internal finish of said drilled hole, hence an improved product is obtained. Furthermore, it should be noted that Temple *et al.* ('311) specifically teach maintaining the laser power low at the beginning of the drilling process in order to avoid damage due to exhaust products, hence teaching a similar two-step laser drilling process as WO 86/02301.

Regarding claims 13-14, WO 86/02301 teaches altering the pulse width and peak energy (see Abstract and page 6, lines 20-25). Therefore, it would have been obvious for one of ordinary skill in the art to have altered the pulse width and peak energy for a second train of higher power pulses as compared to a first train of laser pulses taught by WO 86/02301 to drill and trim said hole as taught by Temple *et al.* ('311) in the process of Ayrton ('456) because, WO 86/02301 specifically teaches that low-powered laser pulses avoid delamination of said multi-layered

sheet, whereas Temple *et al.* ('311) specifically teach that altering the power of said laser results in an improved internal finish of said drilled hole, hence an improved product is obtained.

6. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 86/02301 in view of Temple *et al.* (US Patent No. 6,228,311 B1).

WO 86/02301 teaches the basic claimed process of laser drilling a multi-layer sheet by providing a train of low-powered laser pulses to drill through said multi-layered sheet, said low powered pulses preventing delamination, and after said multi-layered sheet has been drilled, higher power pulses are employed. It is submitted that since delamination is avoided, that the resulting inter-layer pull-off force is smaller than an inter-layer adhesion force (see Abstract and page 6, line 4 through page 7, line 14). It is submitted that a train of laser pulses includes a plurality of individual laser pulses, hence at least one pulse.

Regarding claim 12, although WO 86/02301 teaches a second train of high-powered pulses WO 86/02301 does not teach trimming said drilled hole using a second train of high-powered laser pulses. Temple *et al.* ('311) teach laser drilling a hole in which the laser power is increased at the end of the drilling process in order to trim the final shape of said drilled hole (see col. 7, lines 1-11). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a second train of high-power pulses to trim said drilled hole as taught by Temple *et al.* ('311) in the process of WO 86/02301 because, Temple *et al.* ('311) specifically teach that increasing the power of said laser results in an improved internal finish of said drilled hole, hence an improved product is obtained. Furthermore, it should be noted that Temple *et al.* ('311) specifically teach maintaining the laser power low at the beginning of the drilling process in

order to avoid damage due to exhaust products, hence both references teaching a similar two-step laser drilling process.

In regard claim 13-14, WO 86/02301 teaches altering the pulse width and peak energy (see Abstract and page 6, lines 20-25).

Allowable Subject Matter

7. Claims 1-3 are allowed.

8. The following is an examiner's statement of reasons for allowance: the prior art does not teach or suggest a method for laser drilling a hole in a multi-layered sheet material including, drilling said hole through all the layers of the sheet using at least one laser pulse having a first energy such that an inter-layer pull-off force is smaller than an inter-layer adhesion force and, trimming the shape of said hole by at least one laser pulse having a second energy level higher than said first energy level, wherein a time interval of approximately 200 μs exists between said drilling by at least one pulse at said first energy level and said trimming by at least one energy pulse at said second energy level.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stefan Staicovici, Ph.D. whose telephone number is (571) 272-1208. The examiner can normally be reached on Monday-Friday 9:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael P. Colaianni, can be reached on (571) 272-1196. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Stefan Staicovici, PhD

Primary Examiner 8/6/04

AU 1732

August 6, 2004